

DISTRIBUTION AND FACTORS INFLUENCING SPECIES COMPOSITION

2.1 Distribution

Biological soil crusts in North America are diverse and are most evident in arid and semi-arid ecoregions (Fig. 2.1, 2.2). They are also found on shallow lithic sites and in alpine habitats throughout the continent and in many early-successional vegetation types in moister ecoregions. Some crustal organisms are good indicators of a specific vegetation type or ecoregion. Others, including *Microcoleus*, *Nostoc*, *Collema*, *Psora decipiens*, *Cladonia* spp., and *Bryum* spp. are common to many different geographic, climatic, and vegetation types. For instance, the same soil lichens (*Collema*, *Placidium*, *Psora*) dominate crusts of both the Sonoran and Great Basin deserts, as well as areas of South Africa and Australia, although vascular plant species and climate vary greatly between these regions. While most algae, lichens, and bryophytes are cosmopolitan, a few are endemic and may be common on a local or regional level (Table 2.1). For example, several of the squamulose lichens, such as *Placidium squamulosum*, *Psora decipiens*, *Psora cerebriformis*, and *Psora tuckermanii*, have very broad geographic ranges. Others, including *Catepyrenium congestum* and *Psora montana*, are endemic to North America or have narrow geographic ranges within the continent. Squamulose lichens have more endemic species worldwide than any other lichen morphological group.

Similarities in species composition may occur due to similar environmental conditions during the active growth period for crustal organisms. For example, alpine biological crusts actively grow in summer under moisture and temperature conditions that are similar to winter environmental conditions in the Sonoran Desert. Most crust growth occurs during wet, cool periods. In most North American deserts, this is generally late fall to early spring.

The appearance of biological crusts is variable. Physical structure of biological crusts is very similar in the hot deserts of the world, such as the Atacama, Sonoran, Chihuahuan, and Australian deserts, while very different from the physical structure in cool and cold deserts, such as the Colorado Plateau, Great Basin, and the Arctic (Fig. 2.3). Pinnacled crusts are found in areas where crusts are dominated by cyanobacteria, freezing temperatures are common, and vascular plant roots are lacking. Winter freezing heaves the soil upward, forming pinnacle-type microtopography. Subsequent



Figure 2.1 *Arid and semi-arid ecoregions of western North America. Areas shaded in black are cool deserts, while grey-shaded areas are hot deserts.*